Field Cage Resistor Chain Failure Study

Michael Mooney (Colorado State University),
Bo Yu (BNL)

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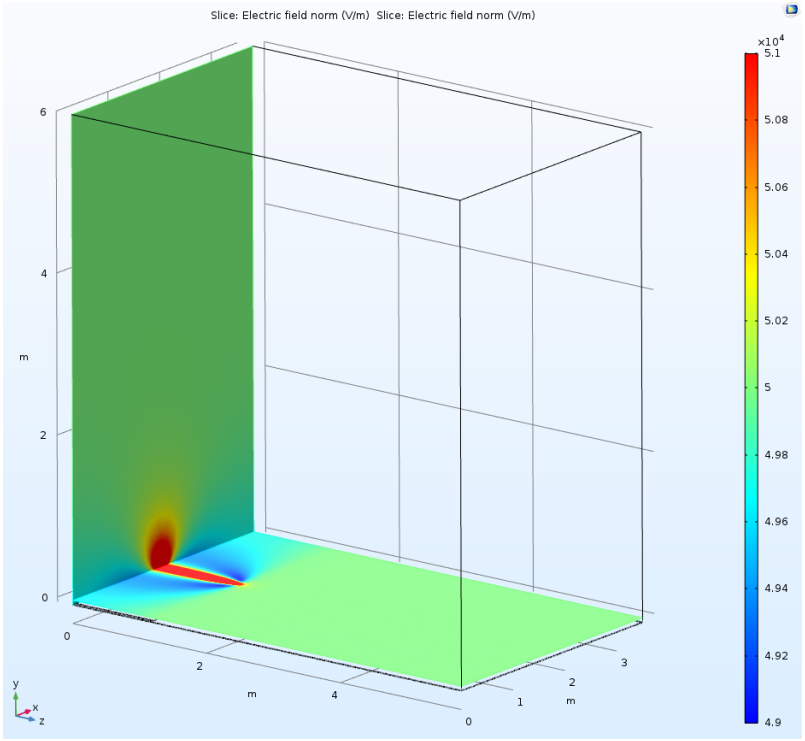
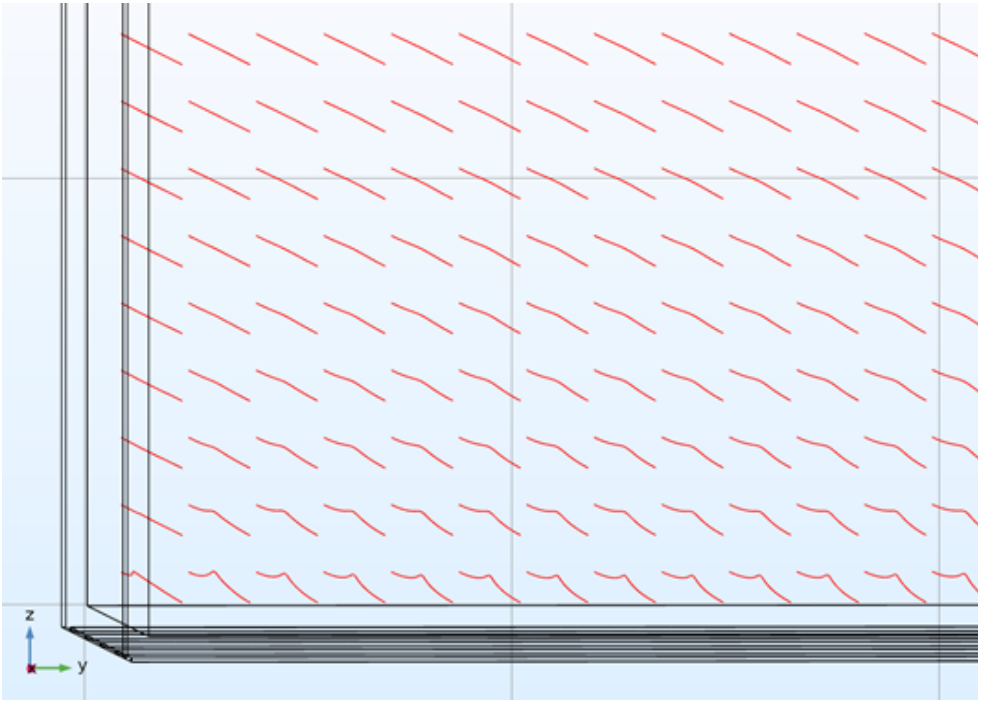
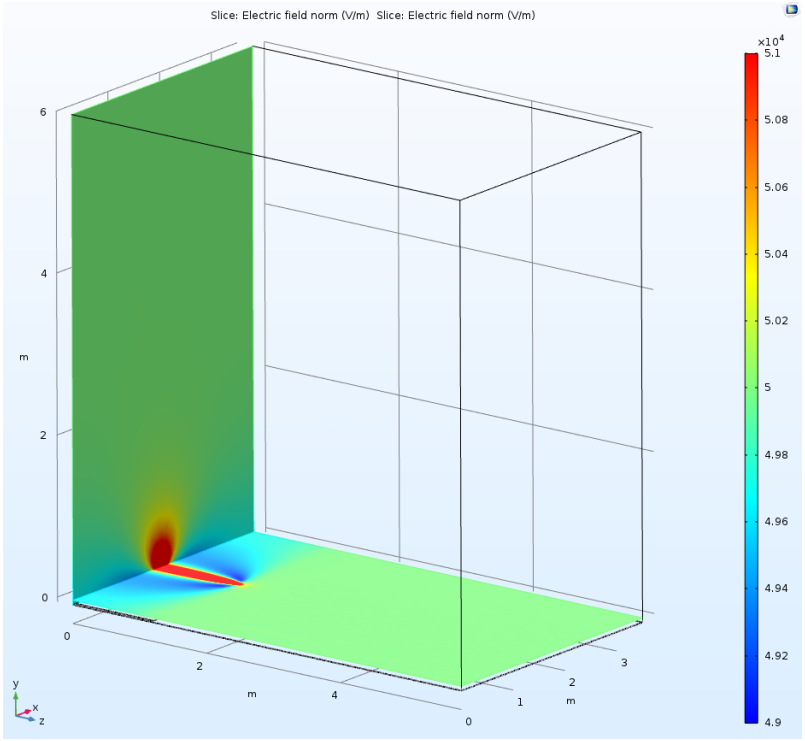
Introduction

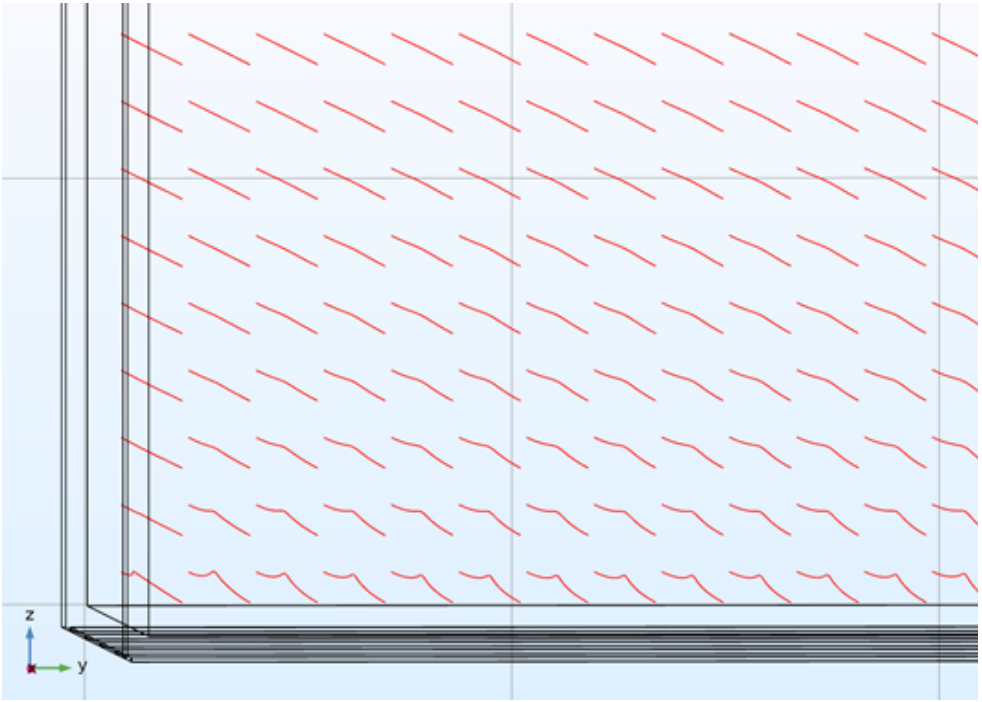




- One motivation for UV laser system: target E field distortions that arise from TPC hardware failure
- One example: field cage resistor chain failure
- Use as case study for TDR – brief overview here

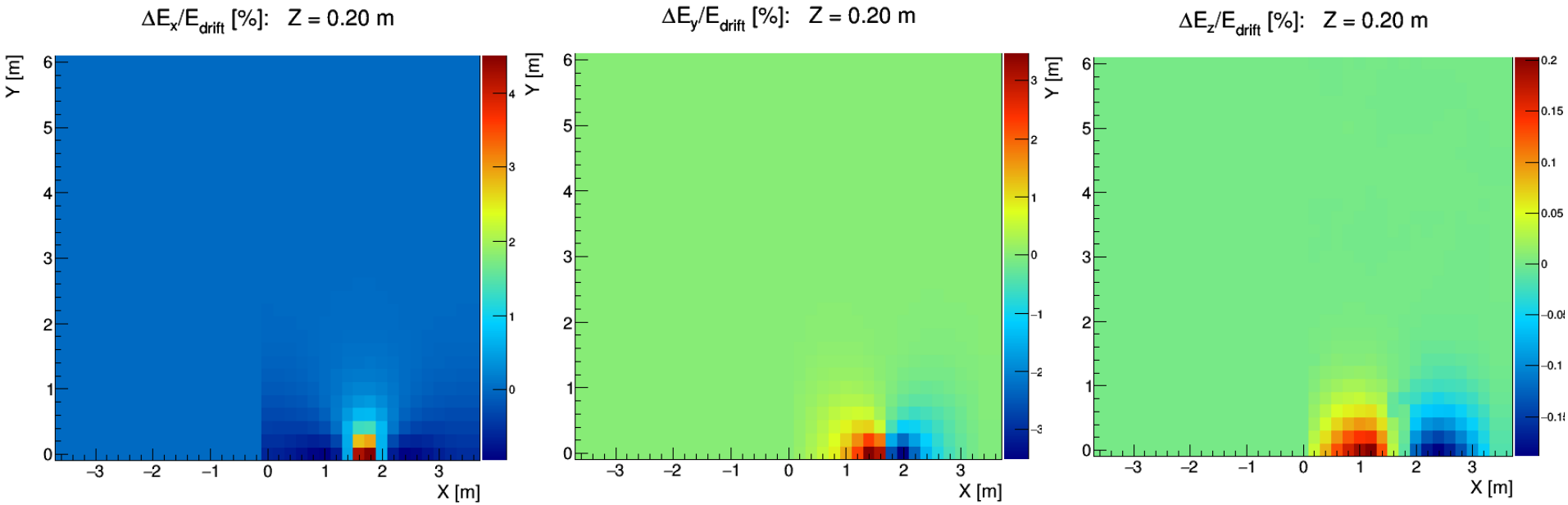
Defect Geometry





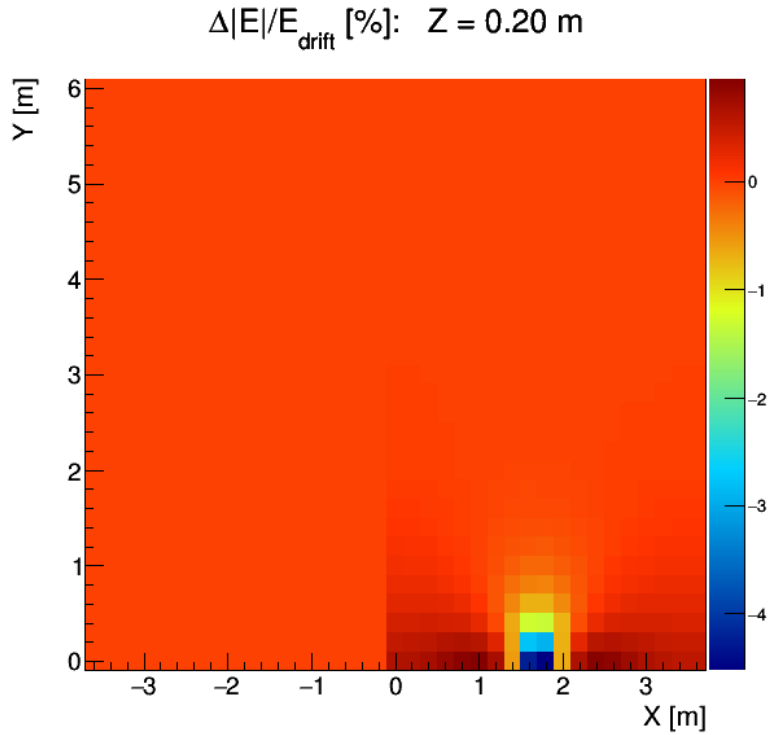
- Field cage is segmented – one failure would be 1.162 m long defect along side of TPC (half APA)
- Example simulated: failure at bottom (Y = 0), Z from 0 m to 1.162 m sees short (3 kV → 6 kV jump)
- Defect at X = 1.708 m (mid drift); use PD-SP geo.

E Field Impact (I)



- Most impact in X and Y directions
- Roughly **4-5%** effect, looking at total E field magnitude shift (second slide)
- E field distortion is not completely local, but strongest in ~1 m^3 volume around defect

E Field Impact (II)



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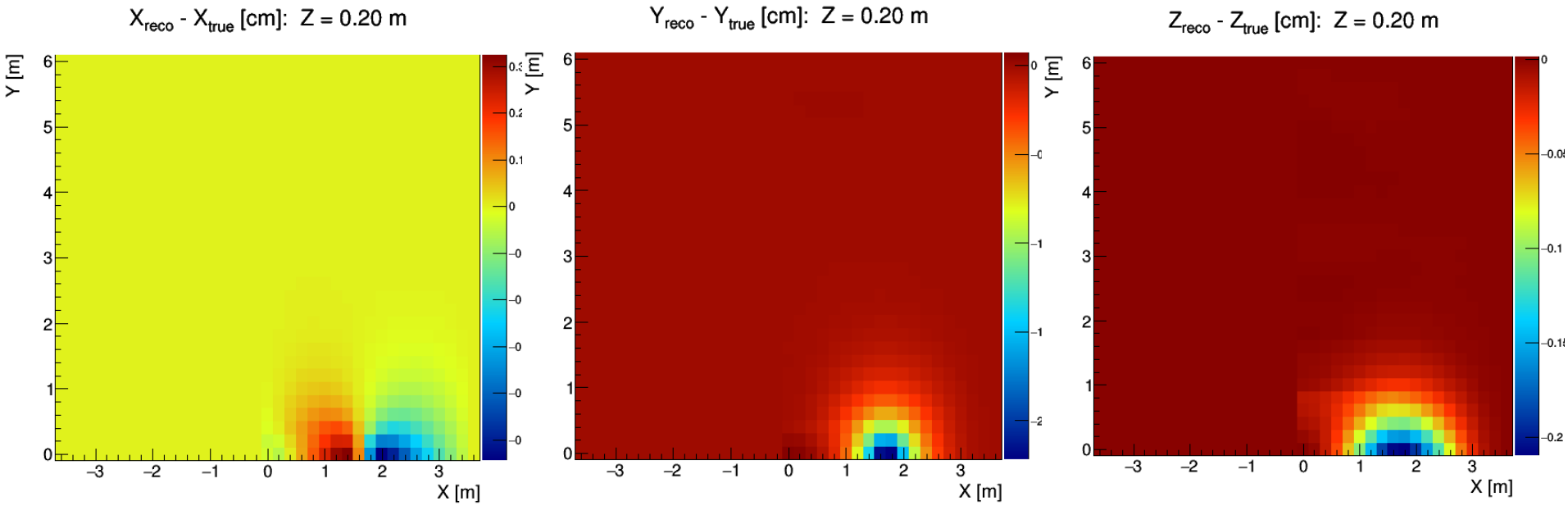
Spatial Offsets, dQ/dx



- Most impact in Y direction
- Roughly **2 cm** offset, looking at Y component
- Combining E field distortion (impacts amount of recombination, thus dQ) with spatial distortion (charge squeezing/stretching impacts dx), expected dQ/dx bias is **1-2%** level (within ~1 m^3 volume)

BACKUP SLIDES